

# VITALY V. GANUSOV

## Curriculum vitae

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### General information

**Current position:** Director's Post-doctoral fellow (Los Alamos National Laboratory, Los Alamos, USA).

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### Academic history

2008- Post-doctoral fellow with Dr. Alan S. Perelson (Los Alamos National Laboratory, Los Alamos, USA).

2005-08 Post-doctoral fellow with Prof. Dr. Rob J. De Boer (Theoretical Biology, Utrecht University, Utrecht, The Netherlands).

2003-04 Post-doctoral fellow with Dr. Rustom Antia (Emory University, Atlanta, GA, USA).

2003 Ph. D. degree (Emory University, Atlanta, GA, USA; thesis adviser: Rustom Antia, Ph.D)

2001 Candidate of Physical and Mathematical sciences (Russian equivalent of Ph.D. degree; Institute of Biophysics, Krasnoyarsk, Russia; thesis adviser: Anatoly V. Brilkov, Doctor of science).

2000 Master of Science (Krasnoyarsk State University, Krasnoyarsk, Russia;  
major: physics/biophysics; thesis adviser: Anatoly V. Brilkov, Doctor of Science)

1997 Bachelor of Science (Krasnoyarsk State University, Krasnoyarsk, Russia;  
major: physics/biophysics; thesis adviser: Anatoly Brilkov, Ph.D.)

### Invited talks

An international workshop "Lymphocyte kinetics in health and disease" (London, UK, May 19-20, 2008)

Wistar Institute, University of Pennsylvania (Philadelphia, USA, April 25, 2008)

University of Bordeaux 2 (Victor Segalen), Institute for Public Health, Epidemiology and Development (ISPED) (Bordeaux, France, April 8-10, 2008)

University of Bath, Department of Mathematics (Bath, UK, January 23-25, 2008)

Mount Sinai Medical School (New York, NY, USA, December 4, 2007)

Yale University (New Haven, CT, USA, December 3, 2007)

Instituto Gulbenkian de Ciencia (Lisbon, Portugal, November 11-14, 2007)  
Insitute for Numerical Mathematics (Moscow, Russia, October 23-24, 2007)  
Central Institute for Tuberculosis (Moscow, Russia, October 23-24, 2007)  
Los Alamos National Laboratory (Los Alamos, New Mexico, USA, July 16-20, 2007)  
Annual meeting of the Canadian Mathematical Society-MIDAS (Winnipeg, Canada, June 3-4, 2007)  
DIMACS workshop “Immuno-epidemiology”, Rutgers University (New Brunswick, NJ, USA, December 10-14, 2006)  
Department of Mathematics, University of Glasgow (Glasgow, UK, October 23, 2006)  
Department of Biology, GA Tech (Atlanta, USA, August 7, 2006)  
Annual meeting of the Dutch Society for Medical Microbiology (Arnhem, The Netherlands, April 2006)  
Laboratory of Ecology, Pierre and Marie Curie University (Paris, France, November 2005).  
Theoretical Biology department, Utrecht University (Utrecht, the Netherlands, July 2004).  
Mathematical Biosciences Institute, Ohio State University (Columbus, Ohio, June 2004).

## Organized conferences/workshops/etc

An International workshop “Lymphocyte kinetics in health and disease” (19-20 May 2008, Regent’s College Conference Center, London, UK). Co-organized with Derek Macallan (St. George’s University of London), Becca Asquith (Imperial college) and Jose Borghans (University Medical Center Utrecht).

## Participation at major conferences

Frontiers in Immunological Memory (Newport Beach, CA, USA, 26-27 September, 2008, poster presentation)  
HIV dynamics and Evolution (Santa Fe, NM, USA, 27-30 April, 2008, poster presentation)  
International workshop “Modeling and identification of distributed parameter systems for cell population dynamics” (Leuven, Belgium, March 12-14, 2008, invited oral presentation).  
Annual meeting of the Dutch Immunology Society (NVVI) (Congress Hotel NH “De Leeuwenhorst”, Noordwijkerhout, the Netherlands, December 20-21, 2007; poster presentation)  
1st International Symposium on Genetic and Immune Correlates of HIV Infection and Vaccine-Induced Immunity (Budapest, Hungary, June 10-13, 2007; selected oral presentation).  
Annual meeting of the Canadian Mathematical Society-MIDAS (Winnipeg, Canada, June 3-4, 2007; invited oral presentation)  
14th international meeting “HIV dynamics and evolution” (Segovia, Spain, April 17-20, 2007; selected oral presentation).  
Keystone meeting “Immunologic memory” (Santa Fe, New Mexico, March 3-8, 2007; poster presentation).

- DIMACS workshop “Immuno-epidemiology” (Rutgers University, New Brunswick, NJ, USA, December 11-13, 2006; oral presentation).
- Annual Meeting of the Society for Mathematical Biology, joint with SIAM (North Carolina State University, Raleigh, July 31-August 4, 2006; selected oral presentation).
- International Forum “Immunology days” (St. Petersburg, Russia, May 29 – June 1, 2006; selected oral presentation).
- Annual meeting of the Swiss Immunology Society (ETH, Zurich, Switzerland, March 30-31, 2006; poster presentation).
- Annual meeting of the Dutch Immunology Society (NVVI) (Congress Hotel NH “De Leeuwenhorst”, Noordwijkerhout, the Netherlands, December 8-9, 2005; poster presentation)
- 34st Annual Autumn Immunology conference (Chicago Marriott Downtown, Chicago, Illinois, November 19-21, 2005; poster presentation).
- “Immunology Models: Cell Signaling and Immune Dynamics”: workshop on mathematical modeling in immunology (Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio, May 10-14, 2004),
- Annual meeting of the Society for the Study of Evolution (Colorado State University, Fort Collins, Colorado, June 26-30, 2004; selected oral presentation).
- Annual meeting of the Society for the Study of Evolution (California State University, Chico, California, June 20-24, 2003; selected oral presentation).
- Workshop on Theoretical Immunology (Florida State University, Gainesville, Florida, May 27-29, 2002; oral presentation).
- 31st Annual Autumn Immunology conference (Chicago Marriott Downtown, Chicago, Illinois, November 22-25, 2002; poster presentation).
- Annual meeting of the Society for the Study of Evolution (University of Tennessee, Knoxville, Tennessee, June 26-30, 2001).
- 1st annual Duke University’s conference on Mathematical immunology (Duke University, Durham, North Carolina, April 23-26, 2000; oral presentation).
- International Conference on Mathematics Applied to Biology and Annual Meeting of the Society for Mathematical Biology (University of Utah, Salt Lake City, Utah, April 3-5, 2000; poster presentation).
- 3rd Siberian Congress on industrial and applied mathematics (INPRIM-98) (Novosibirsk State University, Novosibirsk, Russia, June 22-27, 1998; oral presentation).
- 8th International Symposium “Reconstruction of homeostasis” (Krasnoyarsk Scientific Center, Krasnoyarsk, Russia, March 15-20, 1998; oral presentation).

## Refereed/co-refereed for journals

American Naturalist  
BMC Bioinformatics  
BMC Theoretical Biology and Medical Modelling  
Evolution  
Evolutionary Applications  
Evolutionary Ecology  
Genetics  
Journal of Mathematical Biology  
Journal of Mathematical Analysis and Applications  
Journal of Theoretical Biology  
Journal of Immunology  
Mathematical Analysis and Applications  
Nature  
Nature Medicine  
PLoS Computational Biology  
PLoS Pathogens  
Proceedings of the National Academy of Science of USA  
Proceedings of the Royal Society of London: series B  
Theoretical Population Biology

## Teaching experience

Tutoring a group of 1-st year biology students during the course “Bioinformatica” (Utrecht University, 2006-07).

Supervising graduate students (master level, Utrecht University) and co-supervising a ph.D. student (Institute of Biophysics, Krasnoyarsk, Russia).

Teaching assistance during the course “Theoretical Biology” (Utrecht University, 2005).

Teaching assistance during the course “Immunology and Epidemiology” (Emory University, 2001).

## Scientific expertise

- Mathematical biology;
- Immunology of CD4 and CD8 T cell responses to viral infections;
- Ecology and evolution of infectious diseases.

## Programming skills

- programming in C
- experienced in using software package *Mathematica*

## List of potential referees

### Referees for competence in mathematical modelling

- Alan S. Perelson, ph.D. (Los Alamos National Laboratory, USA; expertise: *population biology, theoretical immunology*, [asp@lanl.gov](mailto:asp@lanl.gov))
- Rob J. De Boer, Prof. Dr. (Utrecht University, The Netherlands; expertise: *population biology, theoretical immunology*, [r.j.deboer@uu.nl](mailto:r.j.deboer@uu.nl))
- Rustom Antia, ph.D. (Emory University, USA; expertise: *population biology, theoretical immunology*, [rustom.antia@emory.edu](mailto:rustom.antia@emory.edu))
- Sergei S. Pilyugin, ph.D. (University of Florida, USA; expertise: *dynamical systems, theoretical immunology*, [pilyugin@math.ufl.edu](mailto:pilyugin@math.ufl.edu))
- Becca Asquith, ph.D. (Imperial College, UK; expertise: *theoretical immunology*, [b.asquith@imperial.ac.uk](mailto:b.asquith@imperial.ac.uk))
- Daniel Coombs, ph.D. (University of British Columbia, Canada; expertise: *population biology, theoretical immunology*, [coombs@math.ubc.ca](mailto:coombs@math.ubc.ca))

### Referees for collaborations with experimentalists

- Frank Miedema, Prof. Dr. (University Medical Center Utrecht, The Netherlands; expertise: *population biology of HIV infection*, [F.Miedema@umcutrecht.nl](mailto:F.Miedema@umcutrecht.nl))
- Phillip D. Hodgkin, ph.D. (Walter and Eliza Hall Institute of Medical Research, Australia; expertise: *experimental and theoretical immunology*, [hodgkin@wehi.edu.au](mailto:hodgkin@wehi.edu.au))
- Francesca Di Rosa, ph.D. (University of Rome “La Sapienza”, Italy; expertise: *experimental immunology*, [francesca.dirosa@uniroma1.it](mailto:francesca.dirosa@uniroma1.it))
- Irina Lyadova, Doctor of Science (Institute of Tuberculosis, Moscow, Russia; expertise: *experimental immunology*, [ivlyadova@mail.ru](mailto:ivlyadova@mail.ru))
- Anatoly V. Brilkov, Doctor of Science (Federal Siberian University, Krasnoyarsk, Russia; expertise: *experimental and theoretical microbiology*, [abrilkov@lan.krasu.ru](mailto:abrilkov@lan.krasu.ru))

## Awards and Fellowships

- 2008-10 Director’s Postdoctoral Research Fellowship, Los Alamos National Laboratory, United States Department of Energy (Los Alamos, NM, USA)
- 2007 Travel grant to participate in the work of the Keystone meeting “Immunologic memory” (Santa Fe, NM, 2007).
- 2006 First place in the contest of oral presentations of young immunologists during the conference “Immunology days”, St. Petersburg, 2006

- 2005-07 Marie Curie Incoming International Fellowship (# 019735, title: “Developing quantitative methods for estimating birth and death rates of immune cells using CFSE label”)
- 2002 Krasnoyarsk Region Science Foundation personal grant for young scientists (KRSF #13G094)
- 2002 Krasnoyarsk Region Science Foundation grant (KRSF #11F0007M)
- 1998-99 Scholarship of the President of Russia for outstanding students for studying abroad (Emory University, Atlanta, GA, USA).
- 1996-99 Scholarships of the President of Russia for outstanding students.
- 1997 Award of the Mayor of Krasnoyarsk City to young talents.
- 1996-99 Fellowship grants of the International Soros Science Education Program (ISSEP) (s96-1710, s97-188, s98-963, s99-407).
- 1995 Fellowship of the Krasnoyarsk Region Science Foundation for outstanding students.

## Scientific publications

- Ganusov V. V.** and R. J. De Boer (2008) Killing of infected cells by CTLs follows the law of mass-action *PNAS* (in preparation)
- Zilman, A., **V. V. Ganusov**, and Alan S. Perelson (2008) Stochastic models of cell proliferation and death *Biophysical Journal* (submitted)
- Ganusov V. V.**, J. M. A. Borghans, and R. J. De Boer (2008) Explicit kinetic heterogeneity: a new method for interpreting data from stable isotope labeling experiments *PLoS Comput Biol* (in preparation)
- Asquith B., J. M. A. Borghans, **V. V. Ganusov**, and D. Macallan (2008) Lymphocyte kinetics in health and disease *Trends Immunol* (in revision)
- Ganusov V. V.** and R. J. De Boer (2008) Estimating in vivo death rates of targets due to CD8 T cell-mediated killing *J Virol* 82(23): 11749-57
- Ganusov V. V.** and R. J. De Boer (2008) Tissue distribution of lymphocytes and plasma cells and the role of the gut: response to Pabst et al. *Trends Immunol* 29(5): 209-210
- Ganusov V. V.** and R. J. De Boer (2007) Do most lymphocytes in humans really reside in the gut? *Trends Immunol* 28(12): 514-518
- Ganusov V. V.** (2007) Discriminating between different pathways of memory CD8+ T cell differentiation *J Immunol* 179(8): 5006-13
- Althaus, C. L., **V. V. Ganusov** and R. J. De Boer (2007) The Dynamics of CD8+ T Cell Responses during Acute and Chronic Lymphocytic Choriomeningitis Virus Infection *J Immunol* 179(5): 2944-51
- Ganusov V. V.**, D. Milutinović and R. J. De Boer (2007) IL-2 regulates expansion of CD4+ T cell populations by affecting cell death: insights from modeling CFSE data *J Immunol* 179(2): 950-957
- De Boer R.J., **V. V. Ganusov**, D. Milutinović, P.D. Hodgkin, A.S. Perelson (2006) Estimating lymphocyte division and death rates from CFSE data. *Bull Math Biol* 68(5):1011-31

- Ganusov V. V.** and R. J. De Boer (2006) Estimating costs and benefits of CTL escape mutations in SIV/HIV infection. *PLoS Comput Biol* 2(3): e24
- Ganusov V. V.** and R. Antia (2006) Imperfect vaccines and the evolution of pathogens causing acute infections in vertebrates. *Evolution* 60(5): 957-69
- Ganusov V. V.**, S. S. Pilyugin, R. Ahmed, and R. Antia (2006) How does cross-reactive stimulation affect the longevity of CD8+ T cell memory? *PLoS Comput Biol* 2(6): e56
- Ganusov V. V.**, S.S. Pilyugin, R.J. De Boer, K. Murali-Krishna, R. Ahmed and R. Antia (2005) Quantifying cell turnover using CFSE data. *J Immunol Methods* 185: 120-32
- Ganusov V. V.** and R. Antia (2005) Pathology during acute infections: contributions of intracellular pathogens and the CTL response. *Biol lett* 2: 120-23
- Antia, R., **V. V. Ganusov** and R. Ahmed (2005) The role of models in understanding immunological memory. *Nat Rev Immunol*, 5: 101-11
- Pilyugin S.S., **V. V. Ganusov**, K. Murali-Krishna, R. Ahmed and R. Antia (2003) The rescaling method for quantifying the turnover of cell populations. *J Theor Biol*, 225(2): 275-83
- Ganusov V. V.** (2003) The role of the CTL response and virus cytopathogenicity in the virus decline during antiviral therapy. *Proc Roy Soc Lond B*, 270: 1513-18
- Ganusov V. V.** and R. Antia (2003) Trade-offs and the evolution of virulence of microparasites: do details matter? *Theor Pop Biol*, 64: 211-220
- Ganusov V. V.** (2003) Evolution of virulence: adaptive or not? *Trends Microbiol*, 11(3): 112-13 (commentary)
- Ganusov V. V.** and Brilkov A.V. (2002) Estimating the instability parameters of plasmid-bearing cells. I. chemostat culture. *J Theor Biol*, 219(2): 193-205
- Ganusov V. V.**, C. T. Bergstrom and R. Antia (2002) Within-host population dynamics and the evolution of microparasites in a heterogeneous host population. *Evolution*, 56(2): 213-223
- Brilkov A. V., **V. V. Ganusov**, E. V. Morozova and Pechurkin N. S. (2001) Computer modeling of the biotic cycle formation in a closed ecological system. *Adv Space Res*, 27(9): 1587-92
- Ganusov V. V.**, A. V. Brilkov and N. S. Pechurkin (2001) Population dynamics of bacterial plasmids. *Mathematical modeling*, 13(1): 77-98 (in Russian)
- Ganusov V. V.**, A. V. Brilkov and N. S. Pechurkin (2000) Mathematical modeling of the population dynamics of unstable plasmid-bearing bacterial strains during continuous cultivation in the chemostat. *Biofizika*, 45(5): 881-887 (in Russian)
- Pechurkin N. S., E. A. Baranova, A. V. Brilkov, **V. V. Ganusov**, T. V. Kargatova, E. E. Maksimova, L. Yu. Popova (1999) Modeling of genetically engineered microorganisms introduction in closed artificial microcosms. *Adv Space Res*, 24(3): 335-41.
- Ganusov V. V.**, A. V. Brilkov and N. S. Pechurkin (1999) Structural approach to simulating the population dynamics of unstable recombinant strains of bacteria containing multicopy plasmids. *Dokl Akad Nauk*, 369(2): 267-70 (in Russian)